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In-situ erosion rate revealed by Be-10 at Kii-shima Island, Wakayama Prefecture, Japan

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Multiple marine terraces, presumed to have been formed by uplift with the Nankai Trough Earthquake, are recognized in the Shionomisaki area, Wakayama Prefecture. These marine terrace surfaces can be used to investigate the crustal deformation history in this area, if those abandonment ages can be determined. Surface exposure dating (SED) using cosmogenic radionuclides (CRNs) is an applicable dating method for this area, where little or no marine terrace deposits. When this method is applied to strong eroding areas, the erosion rate of the target area is an important parameter because ignoring the effect of erosion will lead to underestimation, and the age cannot be limited enough if the erosion rate isn't determined. Therefore, in this study, we attempted to estimate the erosion rate in this area as a preliminary step for dating. Quartz Porphyry is distributed over most of Kii-shima. The Quartz Porphyry contains quartz grains of visible size (< 10 mm in diameter), but their quartz content is not as high as that of Granite. Therefore, this rock has almost not been used for SED because of the difficulty of extracting quartz. If a measurement method can be established for this type of rock, the applicability of SED can be extended. The analysis of CRNs for Quartz Porphyry is another purpose of this research.

Samples were collected from the highest and one level below terraces on the island. These terrace surfaces are considered to have lost their original topographic surface by erosion after their abandonment. The SOS-H001 site is on the island's west side, where the ridge-top top and its roots are exposed and unweathered Quartz Porphyry can be seen over the entire artificial scarp. On the other hand, site SKN-H002 is located on the island's east side, where a soil layer, a weathered layer, and heavily weathered Quartz Porphyry are observed from top to bottom in order. As some of those samples were collected with a relatively low amount of quartz, they resulted in a large measurement error by Accelerator Mass Spectrometry. Despite the large error, their ^{10}Be concentrations at both sites almost show an attenuation trend with depth from the surface.

The erosion rates obtained by the fitting model were $27 \pm 22/-17$ mm/kyr at site SOS-H001 and $130 \pm 270/-58$ mm/kyr at site SKN-H002. The erosion rate at site SOS-H001 indicates the weathering erosion rate of the top. Based on these results, the erosion rate at site SOS-H001 can be used to estimate the exposure age of Quartz Porphyry samples collected from directly exposed rock such as top on Kii-shima Island.

Student Submission

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